THE INFLUENCE OF RECENT AND ANCIENT ANTARCTIC ICE MASS CHANGE ON CRUSTAL SEISMICITY

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During the past 10,000-14,000 years the Antarctic ice sheet sustains one of the strongest planetary surface loading events known. It is estimated that ice mass changed by as much 9×10^6 Gt. This change, partitioned over 70 % of Antarctica's surface area, means that the ice overburden changed by about 1 MPa. This implies that near, or beneath, deglaciating regions, the fault-normal stresses change, on average, at a rate of about 0.1 kPa/yr during glacial collapse from glacial maximum. During accelerated deglaciation (12 - 7 kyr BP), and in localized regions, the rate rises and is comparable to the long-term average tectonic loading rate sustained by typical plate interiors ($\sim$ 1 kPa/yr) [*Kanamori and Brodsky, 2001, Physics Today, 102, 34-40*]. For glacial loading/unloading to drive large earthquakes in the continental interior of Antarctica, the shear fracture energy must, simultaneously, be sustained during the diminution of overburden. In addition to computing observable quantities, such as present-day geoid change and crustal motion, we also determine the full stress tensor in the crust of Antarctica for a data-constrained deglaciation scenario with various lithosphere thicknesses and mantle viscosities. The stress components are then used to compute a Coulomb stress field in map-view at the base of a crustal seismogenic layer. In the Wilkes Basin, and to the west, near the French Dumont D'Urville scientific station on the coast of East Antarctica, the rebound-induced Coulomb failure stress (ΔF) reaches -0.5 to -0.75 MPa for several of the forward models. These are stronger stress shadows for promoting brittle failure (by $\sim$ 50 $\times$) than are typically calculated for earthquake fault interaction in Japan and California. The predictions are quite sensitive to lithospheric thickness and to tectonic stress field, but, suprisingly, less so to mantle viscosity.